

Chapter 4



Test Equipment & Safety Procedures

Chapter 4 - Overview

- ◆ Identify testing equipment
- ◆ Identify procedures for use and care of test equipment
- ◆ Describe the steps to perform a measurement using a 19 liter/5-gallon test measure
- ◆ Safety
- ◆ Model report forms

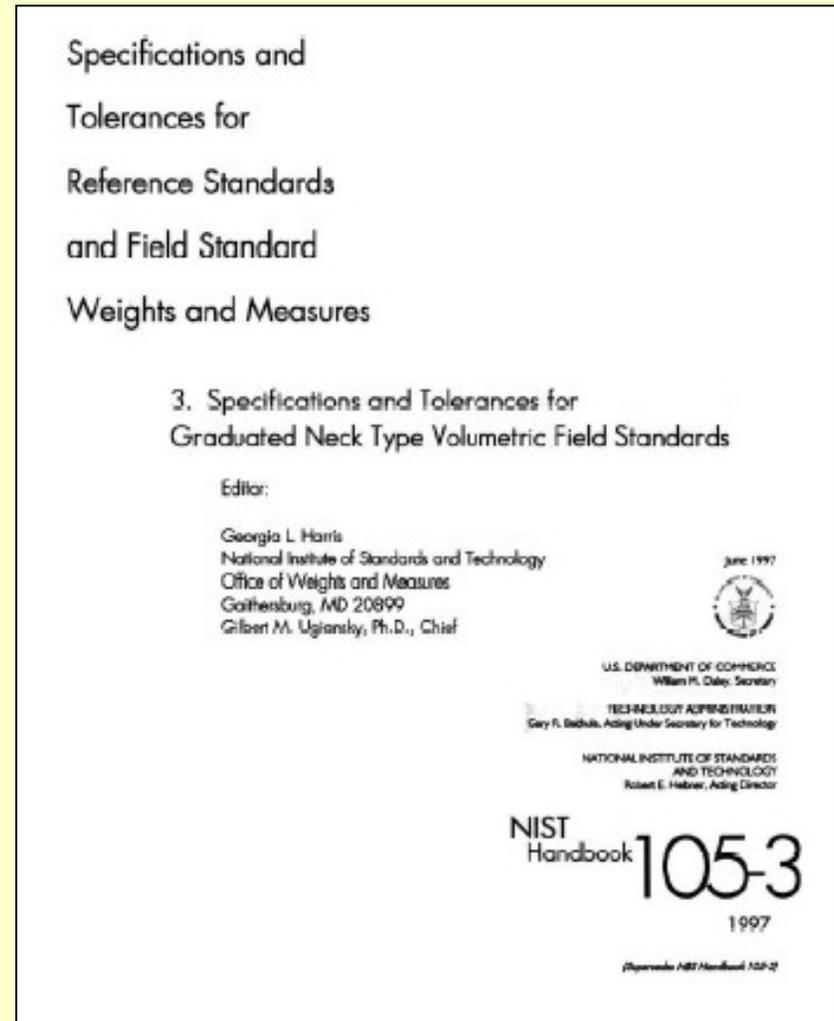
Basic Equipment

- ◆ Linear Measure
- ◆ 19 L/5-gallon test measure
- ◆ Metal bucket
- ◆ Metal funnel
- ◆ Report Form
- ◆ NIST Handbook 44
- ◆ Examination Procedure Outlines (EPOs)
- ◆ Calculator
- ◆ Security seals/Applicator
- ◆ Inspection tags
- ◆ Fire extinguisher
- ◆ Hand tools
- ◆ Warning Flags/Cones
- ◆ Level

NIST Handbook 105-3

Requirements for Test Measures & Provers

- ◆ Specifications & Tolerances for Test Measures
 - ◆ Size
 - ◆ Construction material
 - ◆ Physical properties
 - ◆ Accuracy requirements
 - ◆ Test methods
 - ◆ Uncertainties

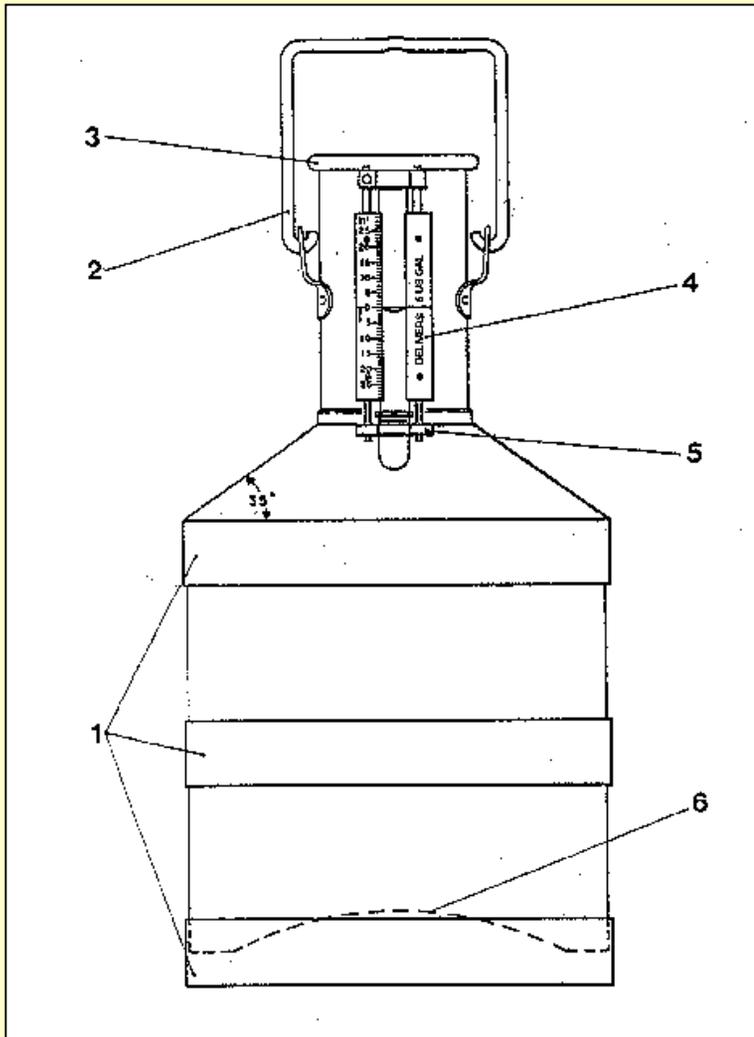


Test Measure/Prover

- ◆ **Test Measure** - small ($\leq 40\text{L}/10\text{ gal}$)
 - ◆ Hand-held

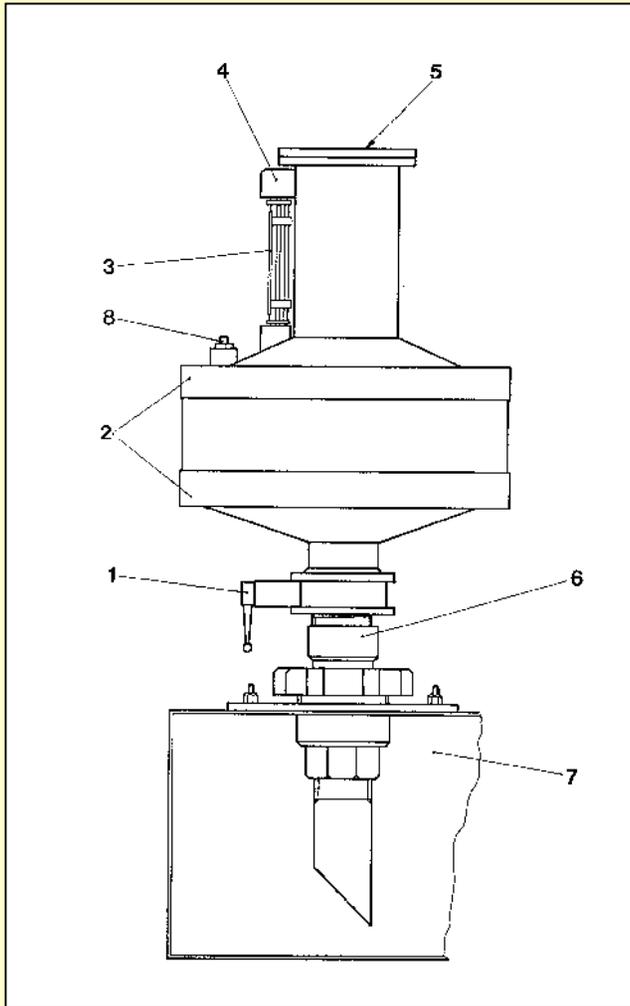
- ◆ **Prover** - large ($> 40\text{L}/10\text{ gal}$)
 - ◆ Bottom-drain is implied
 - ◆ Not hand-held
 - ◆ Includes small mounted units with a bottom drain

Test Measure



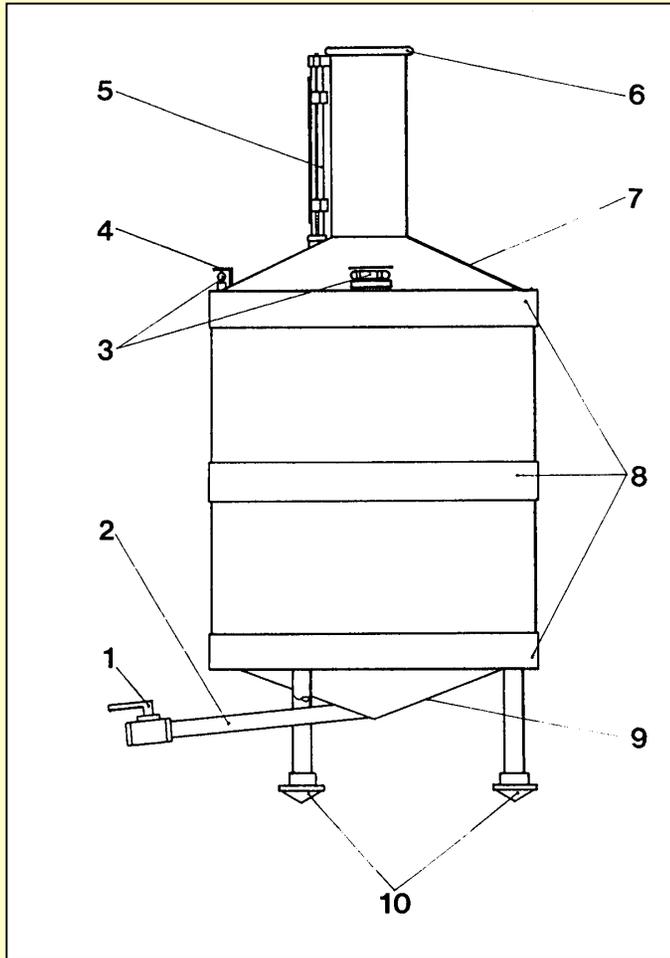
- 1 - Reinforcing Bands
- 2 - Handle (raised)
- 3 - Rolled Bead
- 4 - Gauge Assembly
- 5 - Gauge Mounting
- 6 - Concave Bottom

Prover



- 1 - Drain Valve
- 2 - Reinforcing Bands
- 3 - Gauge Assembly
- 4 - Gauge Mounting
- 5 - Neck Plate
- 6 - Ball Joint
- 7 - Storage Tank
- 8 - Level

Prover



- 1 - Drain Valve
- 2 - Drain Slope 5°
- 3 - Levels
- 4 - Level Cover
- 5 - Gauge Mounting
- 6 - Rolled Bead
- 7 - Cone Pitch 25°
- 8 - Reinforcing Bands
- 9 - Cone Pitch 20°
- 10 - Adjustable Legs

Test Measures

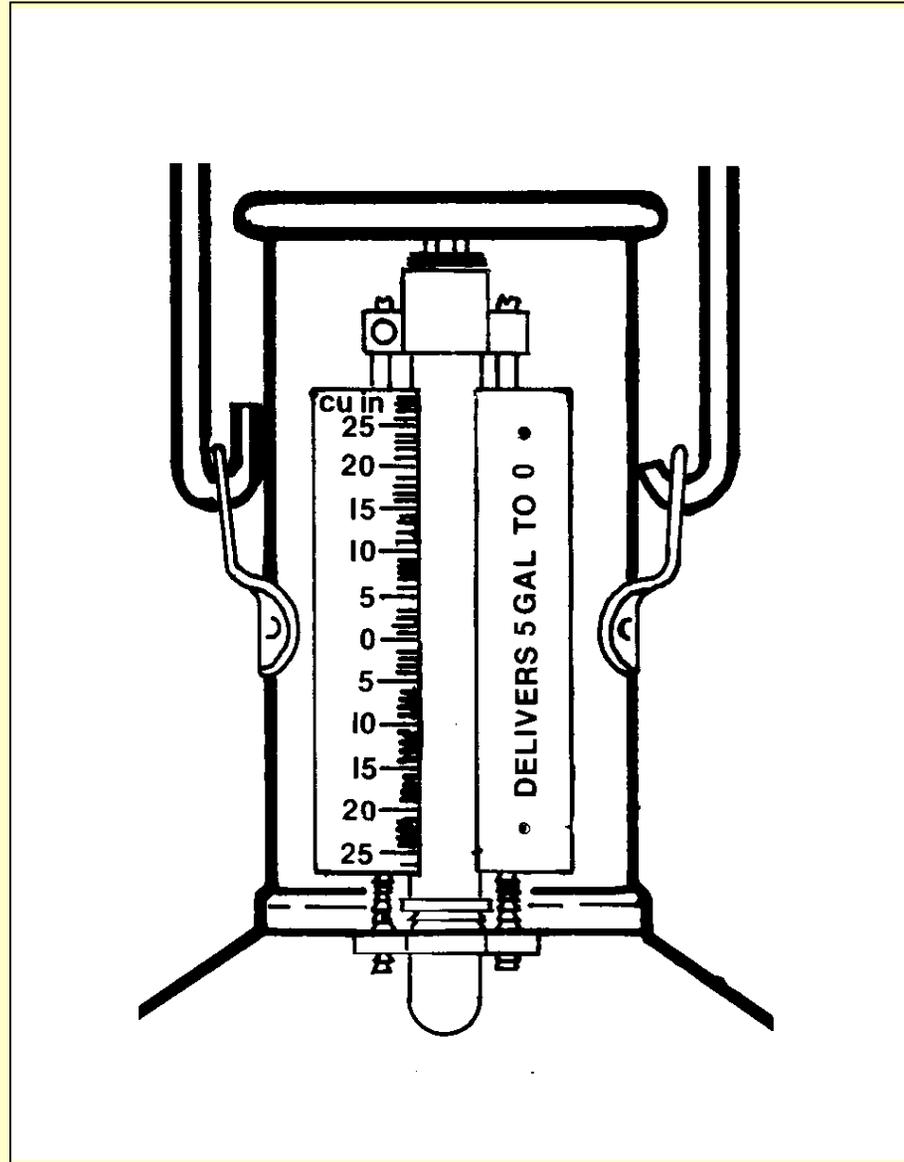


Mild Steel



Stainless Steel

Gauge Assembly



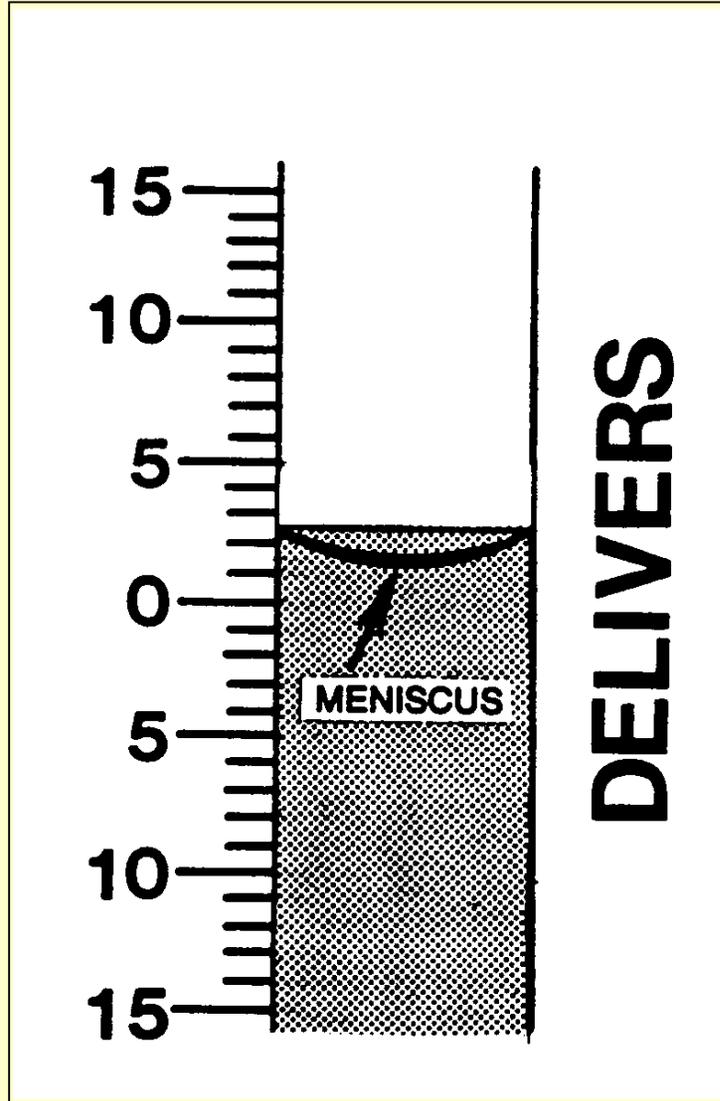
The Meniscus



- ◆ The capillary action of glass tube creates a curvature called the “meniscus”
 - ◆ Concave surface of liquid
 - ◆ Appears lens-shaped

- ◆ Read prover at bottom of meniscus

Reading the Meniscus



Reading the Prover



- ◆ Level the test measure/prover
- ◆ If product foams (e.g., diesel fuel), allow it to settle before reading
- ◆ Position yourself so the bottom of the meniscus is at eye level

Reading the Prover



- ◆ If not exactly at zero, the value will be read as plus (above the zero line) or minus cubic inches (below the zero line)
- ◆ If the reading is between graduations, round off to the “nearest” graduation.
- ◆ If the bottom of the meniscus is exactly in the middle of a graduation, read the value of the “even” numbered graduation.

Special Test Measure



Test Measure/Prover – Calibrated to “Contain”



- ◆ Adjusted to contain its intended volume
- ◆ The empty condition is “DRY”
- ◆ Test measures and provers are generally not used in this condition

Test Measure/Prover – Calibrated to “Deliver”

- ◆ Adjusted to deliver its intended volume
- ◆ The empty condition is “WET”
- ◆ Contains slightly more liquid than marked
 - ◆ Accounts for product clinging to sides
 - ◆ Deduct 1 cubic inch on 5-gallon dry test measure to compensate for clingage

Using the Prover/Test Measure

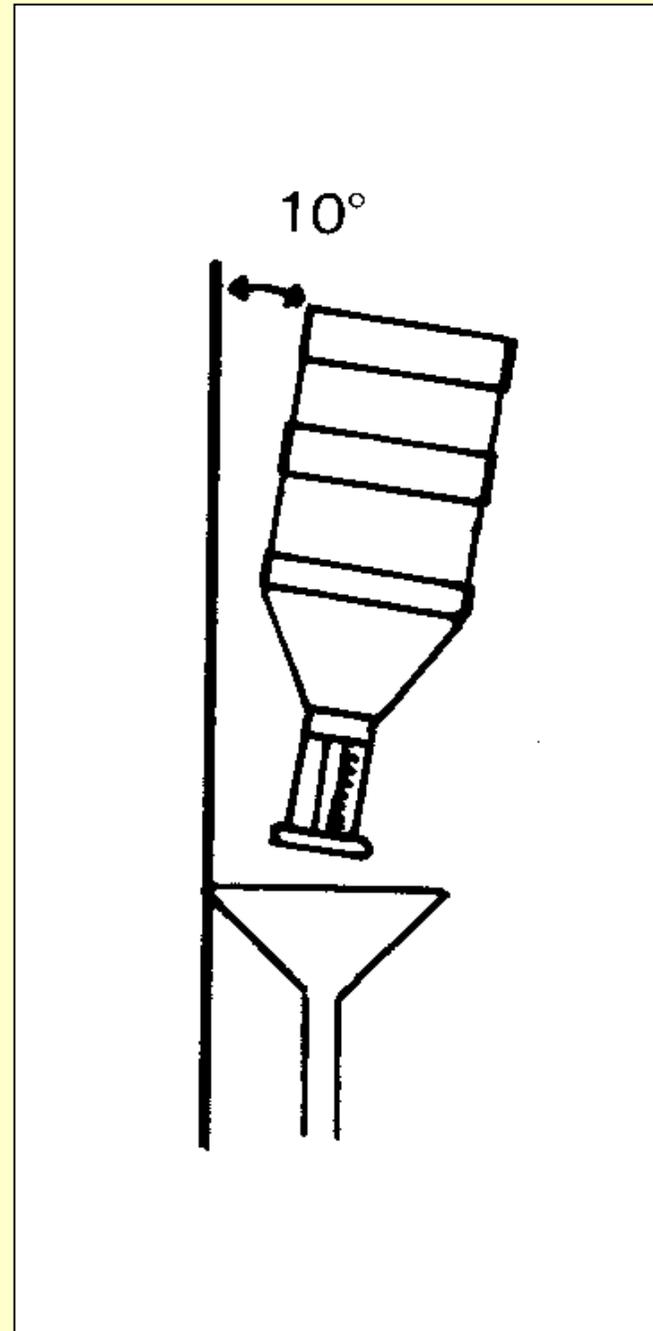
◆ Prover

- ◆ Run a “wet down” run to wet the prover
- ◆ After emptying, allow a 30-second drain

◆ 5 gallon test measure

- ◆ If dry, add 1 cubic inch to gauge reading
- ◆ To empty:
 - ◆ Start with 30-second (\pm 5 second) pour
 - ◆ Follow with a 10-second drain with the measure held at a 10 to 15 degree angle

Emptying the Test Measure



Test Draft - Overview

- ◆ Ensure clean condition of measure to start
- ◆ Drain liquid trapped in nozzle into metal bucket
- ◆ Dispense product until dispenser reads 5 gal
- ◆ Level the test measure
- ◆ Take reading at bottom of the meniscus
- ◆ Record the measurement
- ◆ Empty test measure
 - ◆ 30-second pour
 - ◆ 10 Second Drain at 10° - 15° angle

Test Measure/Prover Care



- ◆ avoid denting the measure/prover
- ◆ avoid jarring the gauge tube, scale, or mounting bracket
- ◆ keep inside and outside clean and free from contaminants
- ◆ keep dry and rust free
- ◆ report any damage or leaking

Safety - General

- ◆ Know established safety guidelines for your jurisdiction
- ◆ Yield to safety experts
- ◆ Material Safety Data Sheets (MSDS)
 - ◆ Know the nature of the products you will be testing
- ◆ Contact station manager on arrival to discuss inspection and safety
- ◆ Identify location and identification of storage tanks

Storage Tank Identification – Codes and Markings



Safety - Equipment

◆ First Aid Kit

- ◆ check for content requirements
- ◆ replace items used

◆ Safety cones and warning signs

- ◆ block off work area
- ◆ no smoking, no open flame in vicinity
- ◆ traffic control
- ◆ spills or other hazards

Safety - Equipment

◆ Fire Extinguisher

- ◆ Check on a regular interval
- ◆ Select correct size and class

◆ Classes of fire extinguishers

- ◆ Class A - wood, cloth, paper, rubber
- ◆ Class B - flammable liquids & gases
- ◆ Class C - electrical (possible shock)
- ◆ Class D - combustible metals



Safety - Clothing & Equipment

◆ Clothing

◆ Synthetic clothing should not be worn

- possible source of static charge
- melts at high temperature

◆ Wear rubber-soled shoes

- provide traction
- reduce risk of sparks

◆ Other safety gear

- ◆ eye protection, gloves, barrier cream, safety shoes

Safety - Site Considerations



◆ Obstructions

- ◆ Check the ground for areas or items that may cause tripping, slipping, or spilling
- ◆ Check for overhead hazards

◆ Traffic

- ◆ Be aware of vehicles and pedestrians
- ◆ Use safety cones and flags to mark the test area

◆ No smoking or open flames

- ◆ Check for other sources of ignition

Safety – Device Inspection



- ◆ Never leave an activated dispenser unattended
- ◆ Spills
 - ◆ report any spills
 - ◆ use approved absorbent material
 - ◆ mark the area as hazardous
- ◆ Avoid prolonged inhalation of vapors
- ◆ Use proper lifting techniques

Safety - Device Inspection



- ◆ Open both sides of dispenser
 - ◆ Allows dissipation of flammable vapors
- ◆ Check for loose, frayed, or exposed wiring
- ◆ Check for leaks

Report any unsafe conditions and follow your jurisdiction guidelines!

Eliminate Sources of Static Electricity

◆ Grounding

- ◆ Use metal funnel and bucket
 - ◆ don't use plastic safety cone as a funnel!!
- ◆ Place dispenser nozzle against neck of test measure when dispensing product
- ◆ Don't set test measure in pick-up with plastic bed liner
- ◆ Place neck of test measure against the metal funnel when returning product to storage
- ◆ Ground the test cart used to transport provers from dispenser to product storage

Avoid “Switch Loading”



- ◆ **“switch loading”** is the loading of a low-vapor-pressure product (diesel fuel, kerosene, heating oil) into a test measure or other vessel that contains flammable vapor from a high-vapor-pressure product (aviation or motor gasoline)

Avoid “Switch Loading”



- ◆ Recommended test procedure for a service station that sells both diesel fuel and gasoline
 - ◆ **test the devices that dispense diesel fuel first**
 - ◆ **test the devices that dispense gasoline last**

Report Forms - General



- ◆ Dispenser(s) examined
- ◆ Type of product dispensed
- ◆ Totalizer reading - before & after
- ◆ Total liters/gallons dispensed
- ◆ Test results
- ◆ Device status (approval/rejection) and action to be taken
- ◆ Correct identification of storage tanks
- ◆ Total of product returned to each storage tank

Why Use A Report Form ?



- ◆ Primary Record
- ◆ Historical data record
- ◆ Comprehensive
- ◆ Clearly describes official action
- ◆ Guide to serviceperson
- ◆ Signature verifies receipt of information

Chapter 4 - Summary



- ◆ Tools and equipment for field test
- ◆ Test Measures/Provers
 - ◆ Calibration
 - ◆ Use
 - ◆ Care
- ◆ Knowledge of safety practices
- ◆ Report forms